

62

[1960]

FIELD AND PASTURE SEED MANUAL

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VALUABLE AND
UP-TO-DATE
INFORMATION ON
SEEDING MIXTURES
VARIETIES
PLANTING
MANAGEMENT

Legumes

Grasses

Sorghums

Forages

Rudy-Patrick Seed Co.

KANSAS CITY, MO.

FOREWORD

The old proverb, "As ye sow, so shall ye reap," could well serve as the theme of this manual. In the various sections, information is provided that may help you make wise decisions on what to plant. Attention is centered on the main grasses and legumes, temporary forage crops, sorghums, and lawns for use in Missouri. Small grains, hybrid corn, and soybeans for seed production are omitted since excellent year-to-year summaries of variety performance and recommendations are made available by the Agricultural Experiment Station.

Major topics covered in the different parts of the manual are:

1. What crop or crop mixture is it best to use for various purposes in the different areas of the state?
2. What are the recommended seeding rates for each crop or mixture?
3. What are the most suitable recommended varieties of each crop?
4. How can you tell whether or not seed is of good quality?
5. How do you seed to get the best stand possible?
6. Are there any management tips that are important in using the crop to best advantage?

If these questions concern you, have a look inside. You might find the answers you want to know.

Published bulletins, pamphlets and circulars of State Agricultural Experiment Stations and the United States Department of Agriculture were used freely in preparation of this manual. For the information provided, a grateful acknowledgment is extended.

This Field Seed Manual was made up to apply for the conditions of weather and soil in the state of Missouri. You will find that under most circumstances the same recommendations will apply to the Eastern part of Kansas, Western part of Illinois, and the Southern part of Iowa.

Index	Foreword	Lawns Ky. Blue Grass Tall Fescue
Seeding Mixtures Rate of Seeding	Reeds Canary	
Alfalfa	Wheatgrass and Rape	
Red Clover	Sudan - Forage Sorghum and Grains	
Sweet Clover	Combine Grain Sorghums	
Alsike Ladino White Clovers	Soybeans Millet	
Birdfoot Trefoil Lespedeza	Quality Seed State Seed Law	
Smooth Brome grass	Planting Pointers	
Orchard Timothy	Crop Combinations	

MIXTURES AND RATES FOR SEEDING ROTATION AND PERMANENT PASTURES

Rotation Pasture

Large and profitable animal production can be obtained from rotation pastures which consist of "hay-type" grasses and legumes grown on crop land. Rotation pastures, intended to last from 2 to 4 years only, fit into the regular crop rotation, following small grain and preceding the row crop. If the spring growth is not needed for pasture it can be harvested for hay or for grass silage and the subsequent summer growth can then be used for supplementary pasture.

Grasses and legumes used in rotation pastures must be productive, palatable, nutritious, and easy to establish but they need not be long lived. Mixtures suitable for different situations in Missouri are:

For Deep, Fertile, Well-Drained Soils

1. Bromegrass 8-10 and alfalfa 8-10 pounds an acre.
2. Bromegrass 8-10 and ladino 1 pounds an acre.
3. Timothy 5-10 and alfalfa 8-10 pounds an acre.

For Shallow Soils or Infertile Soils Fertilized and Limed Adequately

4. Timothy 5-10, and ladino 1 pounds an acre.
5. Timothy 5-10, red clover 5, and ladino $\frac{1}{2}$ pounds an acre.
6. Timothy 5-10, alsike 3 and ladino $\frac{1}{2}$ pounds an acre.
7. Tall fescue 10 and sweetclover 10 pounds an acre.

For Infertile Soils to Which Only a Moderate Amount of Fertilizer Will Be Applied

8. Timothy 5-10 and annual lespedeza 15 pounds an acre.
9. Orchardgrass 10 and annual lespedeza 15 pounds an acre.
10. Tall fescue 10 and annual lespedeza 15 pounds an acre.

Permanent Pastures

Much farm land should be left permanently in grass because of steep slopes or for other reasons. Pastures intended to occupy the land for 8 or more years are usually called permanent pastures. Such pastures may be cultivated, fertilized, and reseeded (renovated) from time to time, but they are seldom plowed out and planted to row or close drilled crops. At least one of the grasses and one of the legumes used in a permanent pasture mixture should be either long lived or a consistent reseed.

Mixtures suitable for permanent pasture in Missouri are:

For Deep, Fertile, Well-Drained Soils

1. Bromegrass 10 and ladino 1 pounds an acre.
2. Bromegrass 5, timothy 3 and ladino 1 pounds an acre.
3. Bromegrass 10, alfalfa 6, and ladino $\frac{1}{2}$ pounds an acre.
4. Bromegrass 10, red clover 5, and ladino $\frac{1}{2}$ pounds an acre.

For Shallow or Infertile but Well-Drained Soils Fertilized and Limed Adequately

5. Orchardgrass 10-15, and ladino 1 pounds an acre.
6. Orchardgrass 10-15, red clover 5 and ladino $\frac{1}{2}$ pounds an acre.

For Wet, Heavy Clay, or Clay-Pan Soils

Not Subject to Flooding, Fertilized and Limed Adequately

7. Tall fescue 10, alsike 3, and ladino $\frac{1}{2}$ pounds an acre.

No Seeding Complete Without NODOGEN Nitrogen Fixing Inoculent

Buy ROYAL Quality Seed

For Infertile Soils to Which Only a Moderate Amount of Fertilizer Will Be Applied

8. Orchardgrass 10 and annual lespedeza 15 pounds an acre.
9. Tall fescue 10 and annual lespedeza 15 pounds an acre.
10. Redtop 5 and annual lespedeza 15 pounds an acre.

For Lands Subject to Flooding, but Only on Soils Adequately Supplied With Nitrogen and Mineral Plant Foods

11. Reed canarygrass 6-8, timothy 3, and alsike 3 pounds an acre.

Crop or Mixture	Seeding Rate Lbs./Acre	Years of Stand Beyond Seeding Year	Adaptation Remarks
Green Manure			
1. Biennial Sweet Clover	3		For general use.
Red Clover	3		
Ladino Clover	1		
2. Alfalfa	6	Annual	For soils adapted to alfalfa.
Ladino Clover	1		
3. Red Clover	5	Annual	For poorly drained areas.
Ladino Clover	1		
4. Sweet Clover	8-10	Annual	For general use on non-acid soils where weevil control program is used.
5. Vetch	20-30	Annual	
Rye	40-50		For general use in Delta area.
Grassed Waterways			
1. Reed Canarygrass	12-15	Several	For general use on wetter soils.
2. Tall Fescue	10-15	Several	For waterways in rotation pasture fields
3. Red Top	5	Several	For general use in Missouri.
Supplemental Pasture and Hay			
1. Sudangrass	15-25	Annual	For general use in Missouri except on very droughty sites and soils very low in fer- tility.
2. Oats	1½ to 2½ bu./acre	Annual	Seeded as companion crop to forage seed- ings and grazed or cut for hay or silage.
3. Oats	3-4 bu./acre	Annual	Seeded alone and fertilized to produce maximum pasture, hay or silage.
4. Winter Rye, Wheat or Barley	2 bu./acre	Annual	Fall seeded for limited fall grazing and early spring pasture.

Planting Dates

Crops	Time to Seed
Alfalfa, Bromegrass, Fescues, Timothy, Reed Canarygrass, Redtop	March, April or first half of August
Red Clover, Ladino Clover, Alsike Clover, Sweet Clover, Birdsfoot Trefoil, Lespedeza, Orchardgrass, Rape, Oats	February, early March
Kentucky Bluegrass	August, early September or late February, early March
Sudangrass, Forage Sorghum, Soybeans for forage, Millet	May, June
Grain Sorghum	Late May, first half of June
Winter Rye	Late September, October

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Seeding Mixtures
Rate of Seeding

Alfalfa

Red
Clover

Sweet
Clover

Alsike
Ladino
White Clovers

Birdsfoot
Trefoil
Lespedeza

Smooth
Bromegrass

Orchard
Timothy

Reeds
Canary

Wheatgrass
and Rape

Sudan - Forage
Sorghum
and Grains

Combine
Grain
Sorghums

Soybeans
Millet

Quality Seed
State Seed Law

Planting
Pointers

Crop
Combinations

Lawns
Ky. Blue Grass
Tall Fescue

ALFALFA (*Medicago sativa*)

A perennial legume with a deeply penetrating taproot of outstanding value for forage purposes.

Facts You Should Know About Alfalfa

According to our agriculture colleges, this excellent legume should be increased in acreage four or five times over. The farmer who plants ALFALFA is doing himself a real service. *Check these advantages* and see if they apply to you.

Alfalfa—What It Does for You:

1. It is the *highest in feeding value* of all commonly grown hay crops.
2. It will outyield any other forage legume for hay, in most years, on fertile, well drained soils with adequate lime and phosphate.
3. Excellent for hog pasture alone and in mixtures with grasses (which reduces danger of bloat), and is becoming increasingly important for cattle pasture.
4. *Builds up soil fertility*—due to its capacity for nitrogen fixation and improvement of soil structure.
5. Used for grass silage.
6. Makes *Dehydrated Alfalfa Meal*.
7. Used for cover cropping to prevent soil erosion in grass legume mixtures.
8. Alfalfa performance in drouth years has been "head and shoulders" above other legumes.
9. Alfalfa hay produces more milk for the dairy farmers.

Special Note on Non-Hardy Alfalfa:

1. Non-Hardy Alfalfa (Example: California, Texas, Arizona Common) will produce hay from spring planting.
2. Is outstanding when used for green manure, especially when Sweet Clover Weevil is prevalent.

Tips for Your Successful Management

1. Use high quality seed.
2. Use seed of adapted variety for the purpose you want. (See Recommended Varieties that follow).
3. Test soil.

4. Prepare a good firm seed bed, lime and fertilize as needed.
5. Seed in early spring or in late summer (first two weeks of August) if conditions favorable.
6. Cut for hay at 1/10 to 1/4 bloom for best combination of yield and quality of forage. Allow 4 to 6 weeks between cuttings for recovery.
7. Avoid grazing or harvesting from about September 20 to October 20 to allow root reserves to build up for winter survival.
8. For pasture use or erosion control, always seed in mixture with grasses.

Recommended Varieties

A number of varieties of Alfalfa are in production and we list below the acceptable ones with comment.

HARDY COMMONS—Kansas Common Alfalfa has always done an outstanding job in the State of Missouri and has been highly recommended by the State College. Oklahoma, Nebraska, North and South Dakota, Montana, and Washington have also given satisfactory results. Common Alfalfas are not wilt resistant, and when this is a problem, one should plant the Certified Buffalo or Vernal varieties. In normal corn rotation, the Common Alfalfas do the job you desire.

ATLANTIC—From New Jersey, California and **NARRAGANSETT** from Rhode Island are high yielding and satisfactory for two to three-year stands. Both have low level of wilt resistance. Seed supplies are limited. Not highly recommended for Missouri.

RANGER—Most widely-grown, wilt resistant variety. Yields well and winter hardy in all parts of state. Its superiority in forage yield becomes apparent especially in the third and fourth year because of its wilt resistant quality. Dairy farmers should give this high consideration.

BUFFALO—Wilt resistant and slightly superior to Ranger in some parts of the state.

VERNAL—New winter hardy, wilt resistant variety from Wisconsin. Outstanding in forage production in hay and pasture trials. Adapted throughout state. Flowers are a mixture of purple, blue green, yellow, reddish colors. Its extensively fine leafiness produces excellent hay.

Certified seed of recommended varieties produced in any area from foundation stocks maintained in the area of adaptation is satisfactory. Much of this seed is produced under irrigation in the western states.

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For Information Only

We list below the Recognized Varieties of Alfalfa grown in the United States and a brief description of each, as published by the United States Department of Agriculture. (The varieties given here are listed in alphabetical order without any implication of being grouped as to variegation, hardiness, wilt resistance or other characteristics.)

AFRICAN—Africa alfalfa is an introduction from Hegaza, Egypt. The seed was sent by H. L. Westover to F. G. Noble of the USDA Experiment Station at Bard, California. Noble observed that this variety did very well in his tests. It is well adapted to the deep southwest, being rapid growing with a quick recovery after cutting. It is not cold resistant. African is a good fall, winter and spring growing type in areas free of bacterial-wilt.

ARGENTINE—Argentine alfalfa traces directly to the country of Argentina and when grown in the United States gives variable and for the most part undependable performance. In growth habit and response it resembles closely the non-hardy and moderately hardy common alfalfas. Yields are usually from 5 to 20 per cent lower than those of adapted domestic strains. It is susceptible to wilt and leaf diseases.

ATLANTIC—Atlantic alfalfa is a high-yielding, fast-recovering variety selected by H. B. Sprague and co-workers at the New Jersey Agricultural Experiment Station. In many characteristics, Atlantic is similar to Hardigan or Baltic, and is classified as a variegated alfalfa. It is not resistant to the bacterial wilt disease, but in areas where bacterial wilt is not a factor, it is one of the best yielding varieties. It is better adapted to the eastern United States than most of the standard varieties.

BUFFALO—This is a highly wilt-resistant selection from Kansas Common alfalfa with similar growth habit and adaption. The one outstanding characteristic in which it differs from Kansas Common is its wilt-resistance. Though not as widely known or grown as Ranger, it is widely adapted through the Central States extending north to New Jersey, Wisconsin, and Washington.

CALIVERDE—This alfalfa is similar to California Common in adaption and growth habit and has in addition resistance to three diseases which cause California growers heavy losses; namely, bacterial wilt, common leafspot and downy mildew. Limited trials in some of the southeastern states indicate that Caliverde may be well adapted to that general part of the United States.

CANADIAN VARIEGATED—This variety, like Grimm, is thought to have originated from natural crosses between Common alfalfa (*M sativa*) and the yellow-flowered alfalfa (*M falcata*). It has been

grown in Canada for many years and is similar to Grimm in flower color and habit of growth, and yields of forage and seed, but in the Northern Great Plains and north central states it is not quite as winter-hardy as Grimm. It is not resistant to bacterial wilt.

CHILEAN 21-5—This is an improved selection from Arizona Chilean. All former Chilean types are being eliminated from certification in Arizona. A tender, productive variety, with no resistance to wilt and the leaf diseases.

COSSACK—This variety is adapted for growing under practically the same conditions as Grimm and has shown no general superiority to that variety. It is probably gradually giving place to the wilt-resistant Ranger wherever wilt is serious.

DU PUIITS—DuPuits is a vigorous, relatively high-yielding variety of alfalfa which shows fast growth recovery following cutting. It was developed by Tournier Freres of Coulommiers, France, and was first tested in the United States in 1947. Results from scattered tests in this country show DuPuits to have good seedling vigor, moderate winter resistance (similar to Buffalo), and satisfactory forage yields in areas where adapted. It has shown some tolerance or possible resistance to leaf spots, but is susceptible to bacterial wilt and stem nematode.

GRIMM—This variety was brought to Minnesota from Germany by Wendelin Grimm in 1857. The hardiness and general adaptability of Grimm alfalfa to regions where alfalfa had never been grown before, combined with its earlier discovery, were probably the principal reasons for its popularity in the northern states and its dominance over similar varieties introduced later such as Baltic, Canadian Variegated, and Hardigan. It is only since the advent of bacterial wilt that the popularity of Grimm has declined. It is very susceptible to wilt, but because of its extreme hardiness to cold it is still used in wilt-infested areas in short rotations.

HAIRY PERUVIAN—There are really two varieties of Peruvian alfalfa—Smooth Peruvian and Hairy Peruvian—but the latter is more generally grown. The Peruvian alfalfas do best when grown under irrigation in areas where minimum winter temperatures do not fall below 10 degrees F. They are adapted to most of California except high elevations and to the southern parts of Arizona, New Mexico, and Texas. They usually give more cuttings of hay during the growing season than most non-hardy varieties. They are not resistant to bacterial wilt.

(Continued on following page)

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Alfalfa

Red
Clover

Sweet
Clover

Alsike
Ladino
White Clovers

Birdfoot
Trefoil
Lespedeza

Smooth
Brome grass

Orchard
Timothy

Lawns
Ky. Blue Grass
Tall Fescue

Reeds
Canary

Wheatgrass
and Rape

Sudan - Forage
Sorghum
and Grains

Combine
Grain
Sorghums

Soybeans
Millet

Quality Seed
State Seed Law

Planting
Pointers

Crop
Combinations

HARDIGAN—This is one of the first varieties of alfalfa to appear as a result of plant breeding work. It was bred for better forage quality and for larger forage and seed yields under Michigan conditions by F. A. Spragg. However, because of its susceptibility to wilt, and lack of general superiority over other wilt-susceptible varieties, it is now on the decline.

INDIAN—It is a variety similar to African in its adaptation and introduced from India. It is a high forage yielding strain in the Southwest where it makes good fall, winter and spring growth on heavy soils. It is not winter hardy, nor is it disease resistant.

LADAK—This variety of alfalfa which was imported from India shows more variegation, a larger percentage of yellow flowers, more variation in growth habits, and greater hardiness than others of this group. It produces a large first crop but is very slow in recovery after cutting. It shows some resistance to wilt and is relatively free from leaf diseases. Ladak has greatest value in regions characterized by dry, cold climates where only one or two cuttings of hay are taken annually.

LAHONTAN—In some areas this variety may replace Talent because of its higher resistance to stem nematodes and bacterial wilt. For areas free from them it is about equal to Talent in productivity. Hardiness is equivalent to that of Buffalo.

MEEKER BALTIC—Baltic alfalfa was discovered in South Dakota in 1905. It is similar to Grimm in growth and hardiness, but is a better seed producer. Meeker Baltic is a regional strain developed over many years' growth in Colorado, and has no disease resistance.

NARRAGANSETT—This is a productive winter variety developed recently in Rhode Island. In range of adaption and in wilt-susceptibility it is similar to Atlantic, but excels it in hardiness. If Narragansett had wilt-resistance along with its high yields and other superior qualities, it could easily become one of the most popular varieties for northern areas.

NOMAD—A pasture type "creeping" alfalfa discovered in Oregon. While it has a relatively low forage yielding capacity compared with strictly hay producing types, Nomad usually produces a good first cutting of hay after which the field can be pastured. Preliminary tests indicate that it has rather wide adaption throughout the northwest and

elsewhere under dry and cold conditions, where bacterial wilt is not a problem.

RANGER—This is the most prominent, hardy, wilt-resistant, variegated alfalfa known today. It is widely adapted throughout the northern and central states, and is taking the place of Grimm and other hardy variegated alfalfas in wilt-infested areas of those states. More certified Ranger alfalfa seed is available and being used in the U. S. today than seed of any other variety. Where wilt is not a factor, it has little if any superiority over most other well-known hardy alfalfas. In areas of mild winters Ranger ordinarily is not as productive as the less hardy varieties, and produces fewer cuttings of green forage.

RHIZOMA—This is another of the "creeping" alfalfas, developed at the University of British Columbia, from crosses between M. Falcata and Grimm. Rhizoma is extremely winter hardy, susceptible to bacterial wilt, and has a forage yielding capacity similar to that of Grimm. Extensive tests throughout the United States do not show that plants of this variety spread by the creeping habit as they do in the area of origin.

SEVELRA—This is a drought-resistant, hardy alfalfa which likely resulted from natural crosses between Orenburg and Semipalatinak and Grimm, so could also be classified with the Northern Variegated alfalfas. It is adapted to areas of relatively low precipitation, typical of southern Idaho where it originated, and that are free from bacterial wilt.

TALENT—The high yields of fine-stemmed, leafy hay, early spring growth, rapid recovery after cutting, late fall growth and its stem nematode resistance make Talent a most useful alfalfa in certain areas of the Pacific Northwest. It is not wilt-resistant. Talent has largely replaced Nemastan.

VERNAL—This is a new variegated, wilt-resistant, hardy alfalfa developed in Wisconsin. In trials there it has excelled Ranger in both yield and stand persistence and as seed supplies become available, it may replace Ranger in that state and in some other wilt-infested areas.

WILLIAMSBURG—A variety of common alfalfa developed in Virginia. It has proved valuable in that state and in some other eastern states because of its resistance to stem rot. In areas of high humidity and summer rainfall it persists better than most other varieties. It has no resistance to the bacterial wilt.

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THE HARD SEED QUESTION

Have you ever looked at the analysis tag on a bag of alfalfa seed which showed germination 65% plus 25% hard seeds and considered this sub-standard or poor quality?

Many people have. This, however, *is not true*, as alfalfa showing such a test could actually prove more desirable than seed showing a germination of 80% plus 10% hard seeds.

Hard alfalfa seeds have an *insurance value*, especially with spring and early summer sown seed. Some of these hard seeds may germinate in two weeks, others in four, six or more weeks, and usually all will sprout before the end of the growing

season. The moderate delays in germination of these hard seeds may thicken the stand by the end of the season if severe losses have occurred previously from frost, drought, insects, or other hazards.

It is seldom advisable to scarify alfalfa to reduce the hard seed content. This process breaks the seed coats and reduces the hard seed count, but seed so treated does not keep too well.

When considering the purchase of alfalfa *remember to add together the germination and hard seed percentages*. Top quality seed should total close to 90%, but bear in mind that 25% to 30% of hard seeds in this total is desirable and could easily prove the difference between a good and a poor stand under adverse conditions!

WHAT IS UNITED STATES VERIFIED ORIGIN SEED?

All Royal Quality Alfalfa Seed Is United States Verified as to Origin

For your protection, you will find on every bag of Royal Alfalfa a Red Tag which shows that the Alfalfa Seed has been verified by the United States Government as to the origin. This safety measure ensures you that the seed is represented properly and will perform as you expect in regard to hardi-

ness over the winter months. All Royal Seed can be traced to the original owner, and if the tag states: "Grown in the State of Dakota," for example, you know the statement to be true. Your Government has verified this fact.

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Orchard
Timothy

Smooth
Brome-grass

Bird-foot
Trefoil
Lespedeza

Alsike
Ladino
White Clovers

Sweet
Clover

Red
Clover

Crop
Combinations

Planting
Pointers

Quality Seed
State Seed Law

Soybeans
Millet

Combine
Grain
Sorghums

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Sorghum
and Grains

Wheatgrass
and Rape

Reeds
Canary

Lawns
Ky. Blue Grass
Tall Fescue

RED CLOVER (*Trifolium repens*)

MOST WIDELY GROWN OF TRUE CLOVERS FOR FORAGE USES

Your Advantages—What Red Clover Does for You

1. Most valuable as 1-year meadow crop in 3- or 4-year rotations.
2. Red Clover is grown for hay, pasture, seed and soil improvement. Following harvest of the first crop, the second crop can be cut for hay; or for pasturage, and left to produce the seed proper, and can be plowed down under for green manure.
3. Probably most important for hay in mixture with Timothy, but also used for soil improvement in various grass-legume seedings.
4. Red Clover is adapted to medium fertile, neutral, or slightly acid soils throughout most parts of the state.
5. Growth is best on well-limed, fertile soils, though it will grow fairly well on moderately acid soils.

Red Clover has a shorter, more branched tap root than Alfalfa and is less drought tolerant. Hay is somewhat below Alfalfa in feeding value.

Tips for Your Successful Management

1. Plant seed of recommended variety as early in spring as possible.
2. Apply lime and fertilizer to soils on basis of soil tests before planting.
3. For hay, cut in early bloom stage.
4. Grow with grass if to be grazed.
5. If second crop for seed, cut first crop earlier than usual.
6. Inoculation is a cheap method of ensuring good nodulation and should always be used.

Recommended Varieties

Use of adapted strains originated in the Corn Belt or similar latitudes in the United States and Canada is important. Common Red Clover from Pacific coastal areas or southern states may suffer winter damage in Missouri. English and other European Red Clovers usually are not too satisfactory.

COMMON—Seed from known origin in Corn Belt or similar latitudes generally satisfactory in performance.

KENLAND—New variety resistant to southern anthracnose. Forage yields average as high as for any other variety. Seed supply now adequate.

Other Varieties Not Recommended

MIDLAND—Composite of several well-adapted Corn Belt strains. High-yielding, and good in adaptation.

DOLLARD—A Canadian variety resistant to northern anthracnose. Seed supply limited.

LA SALLE—New Canadian variety similar in adaptation to Dollard. Seed supply limited.

Ottawa—Canadian variety somewhat below Dollard in yield.

PENNSCOTT—Pennsylvania variety similar to or slightly below Kenland and Midland in yield.

MAMMOTH RED CLOVER

A single cut clover which blooms ten days to two weeks later than Medium Red Clover. Since little or no second crop is produced, and heavy leaf loss may occur before it is ready to cut, Mammoth Red Clover is not considered suitable for hay production. Has tremendous growth which can be plowed under for humus.

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SWEET CLOVER (*Melilotus species*)

A rather coarse stemmed legume with a large, deeply penetrating taproot. Most strains under cultivation are two-year types (biennials), but some annual varieties are grown.

Your Advantages—What Sweet Clover Does for You

1. Of outstanding value as a green manure (soil improving) crop in small grain seedings.
 2. Also used to a minor extent for pasture and hay in grass/legume mixtures.
 3. Highly drought tolerant and productive on wide range of soils, when adequately limed.
- Does not tolerate acid soils.

Tips for Your Successful Management

1. Lime soil well ahead of seeding if soil tests indicate need.
2. Use scarified seed and inoculate.
3. For pasture, use grass/legume mixture to reduce bloat hazard.
4. Watch for weevils in young stands. Spray for control, if needed.
5. Cut small grain companion crop high to give best possible growth and nitrogen fixation by late fall.
6. Plow down for green manure in late fall or before corn planting time next spring.

Recommended Varieties

No weevil resistant or non-bitter varieties available as yet.

MADRID—Biennial yellow type with good seedling vigor. Produces good yield of nitrogen and organic matter in first year of growth.

COMMON BIENNIAL WHITE TYPES—Most strains are later flowering than Madrid and satisfactory for pasture use in second year.

YELLOW BLOSSOM—The blossoms are yellow, and growth is tremendous.

Other Varieties

HUBAM—Annual white type. Not as high in yield of nitrogen and organic matter as Madrid, but may be plowed in fall without danger of volunteer growth from roots the following year.

STANDARD SWEET CLOVER—The Federal Government will not allow us to use the old name of White Blossom, because all Sweet Clover is showing mottled seed which indicates some yellow. This Clover is referred to as Standard Sweet Clover.

EVERGREEN, SANGAMON, AND WISCONSIN LATE WHITE—Late flowering biennial white strains used for longer grazing season in second year than Common White. Seed scarce.

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ALSIKE CLOVER (*Trifolium hybridum*)

Short growing, perennial legume with slender, prostrate stems. Plants branch extensively from the crown. Differs from Red Clover in that flowering heads arise from the joints of the stems and leaves, not at the ends of the main stems.

Your Advantages—What Alsike Clover Does for You

1. Grows best on heavy soils with plentiful supply of moisture.
2. Used mostly in mixture with grasses and other legumes (Timothy and Red Clover) for pasture and hay.
3. Tolerates wet, acid soils better than Red Clover.

Time and method of seeding same as for Red Clover.

Varieties

No improved varieties have been developed. Commercial seed lots from northern areas should be satisfactory.

LADINO AND OTHER WHITE CLOVERS (*Trifolium repens*)

A short-lived perennial legume with a prostrate growth habit. Spreads by stolons which root at joints. Flowers arise from leaf axils of prostrate stems and are white or pinkish in color. Used mainly for pasture in mixture with grasses and often other legumes. Is good as soil improving crop. White clover is better adapted to the moderately heavy to heavy soils. Is not too tolerant of drought or high temperatures and doesn't do well on sandy soils. Common white clover grows too low generally to be of value for hay or silage. *The taller growing Ladino, however, is used for hay and silage in grass-legume mixtures.* This legume is very nutritious and palatable for all types of livestock including swine and poultry. It responds well to good soil moisture conditions and good fertilizer and grazing management. *Needs to be grown in mixtures with grass to reduce bloat hazard.*

Recommended Varieties

LADINO—Is a larger and more productive type than the common wild white clover. Is best for rotation pastures and in meadow mixtures where soil moisture is plentiful. Also valuable for green manure when seeded in oats in mixture with other legumes such as red clover. Seed prices may be high but seed is small—adding $\frac{1}{2}$ to 1 pound of seed to a mixture will give a good stand of Ladino. Should use certified seed to be more certain of trueness to type.

Other Types

COMMON WHITE CLOVER—Is indigenous in most soils. This type not generally recommended for seeding.

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BROADLEAF BIRDSFOOT TREFOIL (*Lotus corniculatus*)

A fine-stemmed, leafy perennial legume with seed-pods borne in a cluster like a bird's foot at the tip of flowering stems. Has five leaflets, three at the end of a leaf branch, and two at the base, instead of only three as with alfalfa and clovers.

Your Advantages—What Birdsfoot Trefoil Does for You

1. Considered as the best available legume for establishment or renovation of permanent pasture in Missouri.
2. Not only can good stands be grazed for many years, but palatability is good, and bloat has not been a problem.
3. Is heat and drought tolerant, productive, and winter hardy.
4. Broadleaf Birdsfoot Trefoil is well adapted to most soil and climatic conditions in the state.
5. It does well on poorly drained pasture areas, good upland soils, and the less fertile, sloping soils, and will respond greatly to good lime and fertilizer practices.
6. Surplus forage can be used for hay or silage, since feeding quality and palatability are similar to alfalfa.

Trefoil does have several drawbacks—good stand establishment is somewhat difficult, and seed costs are quite high. Therefore, attention to the following management tips is important if maximum production is desired.

Tips for Your Successful Management

1. If renovating a pasture, use shallow fall plowing on the contour, if possible. Otherwise, disk heavily or use field cultivator.
2. Lime and fertilize soil as indicated by soil tests.
3. Prepare a good, firm seed bed, *inoculate the seed with special trefoil inoculum*, and sow evenly about $\frac{1}{4}$ to $\frac{1}{2}$ inch deep. Band seeding works all right. Won't come up if planted too deep.
4. Seed early in spring. *Fall seeding not recommended.*
5. Sow alone or in simple mixture with one grass only—Kentucky Bluegrass, Orchardgrass, Timothy, or Bromegrass.
6. If using a companion crop such as oats, graze or mow off oats, and mow off weeds later in season to reduce competition. *Trefoil is a poor competitor with other crops and weeds.*
7. Manage properly after established—don't overgraze, especially in early spring and fall, and maintain soil fertility for best production.
8. On plowable land in rotation systems, alfalfa and red clover are preferred for hay or silage because of easier establishment and cheaper seed costs.

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Recommended Varieties

EMPIRE—Semi-prostrate in growth and recommended for pasture use. Will maintain itself for many years under grazing. Seed produced in local areas from New York Empire is equal to that produced in eastern states.

Other Varieties

EUROPEAN—Imported seed of broadleaf, upright types is not as winter hardy as Empire and must be managed carefully to persist under grazing.

VIKING, CASCADE, GRANGER, MANSFIELD AND PARKER—Are varieties of upright type developed by selection from European strains. Generally will outyield Empire for hay, but may not survive as well under grazing. Seed supplies are limited.

NARROW LEAF BIRDSFOOT TREFOIL (*Lotus tenuis*)—Not recommended in Missouri.

KOREAN LESPEDEZA (*Lespedeza stipulacea*)

An early, short growing, leafy annual legume. Has special value as a pasture legume over entire state. Will take hold and make a stand on infertile, eroded acid soils where other legumes generally fail. Is high in feeding value and palatable for all types of livestock. Recommended mostly for improvement of permanent pastures too rough and broken, or too eroded and unproductive to be renovated or included in crop rotations. Makes most growth from mid-summer up until frost. Can be used for late summer pasture, hay or green manure. Reseeds itself each year.

Management Tips

1. Seed recommended early strain on surface of pasture in late winter.
2. Graze pastures early and continuously to keep grass down and favor establishment, growth, and necessary reseeding.
3. Can sow lespedeza in spring into winter small grains, or seed it with spring-sown oat crop on better, more level soils. Grain crop can be grazed or harvested for hay or grain.

Recommended Variety

STANDARD KOREAN recommended throughout the state. Climax will out yield Korean by about $\frac{1}{3}$ in south Missouri and Kobe has some advantages for seeding in permanent pastures south of the Missouri River. Rowan will out yield Korean about 15 per cent throughout the state. Iowa No. 6, an early Iowa strain, may have some advantages in the northern third of the state.

Lawns
Ky. Blue Grass
Tall Fescue

Reeds
Canary

Wheatgrass
and Rape

Sudan - Forage
Sorghum
and Grains

Combine
Grain
Sorghums

Alsike
Ladino
White Clovers

Soybeans
Millet

Birdsfoot
Trefoil
Lepedeza

Quality Seed
State Seed Law

Smooth
Bromegrass

Planting
Pointers

Orchard
Timothy

Crop
Combinations

SMOOTH BROME GRASS (*Bromus inermis*)

A moderately tall growing, cool season, sod-forming grass with many outstanding features.

Smooth Brome Grass—What It Does for You!

1. Is leafy and palatable over a wide range of maturity.
2. Is high in forage yield.
3. When grown in combination with alfalfa or other legumes, brome is one of best grasses for hay, pasture, silage, and “green chop” feed.
4. Valuable as seed crop and for erosion control.
5. Generally has no serious disease problems and is early starter in the spring.
6. In legume mixtures, outyields most other grasses for hay, silage, and/or “green chop” feed on good soils.
7. Is more tolerant to drought and high temperatures than Timothy and Blue Grass, and will come up better from deeper planting ($\frac{3}{4}$ to $1\frac{1}{4}$ inches)—an important point in dry weather.

Tips for Your Successful Management

1. Good stands can be obtained with early spring or late summer seeding if planted properly and soil moisture sufficient.
2. Use seed of recommended varieties for best establishment and yield.
3. Always plant with a legume, as Brome becomes sod-bound rapidly in pure stands.
4. Manage stand in favor of Alfalfa—use rotation grazing, don’t graze heavy in fall, fertilizer for the legume, cut for hay when Alfalfa is at $\frac{1}{10}$ to $\frac{1}{4}$ bloom.
5. If growing mainly for seed, plant in cultivated rows. Fifty to 80 pounds of nitrogen usually will pay off in increased yields of good quality seed.
6. Use wilt-resistant Alfalfas in mixture with Brome if long-time stands wanted.
7. Will grow well on soil of good structure and drainage with extensive soil treatments.
8. Its slow recovery after cutting or grazing, is the main factor limiting use of Brome Grass in pastures.

Recommended Varieties

LINCOLN, *FISCHER AND ACHENBACH* from Nebraska, Iowa and Kansas, respectively. Are all leafy, tall, good in seed production, establish vigorous stands, and yield about the same for hay or other forage uses.

SOUTHLAND—New Oklahoma variety with good record. Performs about same as above strains, and is especially good in early spring growth the year after seeding. Seed is scarce.

LANCASTER AND LYON—From Nebraska. About as good or slightly inferior to above strains in general performance.

Other Varieties

MANCHAR from Washington and *HOMESTEADER* from South Dakota—are intermediate types and usually below the southern strains in production.

CANADIAN TYPES—Lower in forage yield, less drought tolerant and poorer in stand establishment than recommended varieties.

Other Types of Bromegrass

MOUNTAIN, CALIFORNIA and annual brome grasses are not recommended for forage use in Missouri.

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ORCHARD GRASS (*Dactylis glomerata*)

A moderately hardy, perennial bunch grass, primarily for grass mixtures.

Orchard Grass—Your Advantages and What It Does for You

1. It is one of the best perennial grasses in recovery after cutting and in mid-summer growth when soil moisture is plentiful, and it is generally better than Brome or Timothy in these features.
2. Drought resistance is similar to Brome and better than Timothy.
3. This grass is ready for grazing as early or earlier than Brome grass in the spring, and heads out a week or more earlier.
4. Compared to Timothy, Orchard Grass heads out about two weeks earlier and is ready for grazing much sooner in the spring.
5. In forage productivity, Orchard Grass is similar to Timothy for the season, but growth is more evenly spread out during the grazing year.
6. On light soils, it does better than Brome and compares favorably with Tall Fescue.
7. Orchard Grass is one of the easiest of the grasses to get a stand, especially with spring seeding.
8. It responds well to increased levels of soil fertility.
9. Shade tolerance is better than most other forage grasses.

Tips for Your Successful Management

1. Best results for pasture are obtained by rotation grazing.
2. Should be grown with a legume—Ladino, Red Clover, Birdsfoot Trefoil, or Lespedeza.
3. *Growth in mid-to-late May should be kept down by heavy grazing, or cutting for hay or silage, so plants don't become unpalatable due to heading and seed ripening.*
4. Harvest for hay or silage in early heading stage.
5. Use fertilizers to stimulate production if soil tests indicate need.
6. Plant in early spring, since fall seedings may be damaged by winter killing if growth and cover not present before freeze-up.

Recommended Varieties

COMMERCIAL TYPES—Seed from Virginia, Kentucky and Missouri tracing to old fields generally give stands that yield well, are fairly hardy, and recover well after cutting or grazing. May be somewhat lacking in disease resistance. Different seed lots may vary in performance depending on their history.

Other Varieties

POTOMAC—A new strain developed at Beltsville, Maryland. Is similar in maturity and winter hardiness to commercial types but somewhat better in quality of forage in late summer and fall. Rust resistant and grows well in association with legumes. Certified seed of this strain should be consistent in performance.

TROGDON—A Missouri strain with satisfactory yield and moderate winter hardiness. Seed is limited and more information is needed on performance.

AKAROA (originally from New Zealand), **S143** (from England) and other late maturing, experimental numbers being produced on the west coast are lacking in winter hardiness and don't grow well in mid-summer. They are not recommended.

TIMOTHY (*Phleum pratense*)

One of our oldest hay and pasture grasses in the United States. It is a typical cool-season, bunch grass grown mostly in mixture with red clover for one year meadows or with both clover and alfalfa for semi-permanent pasture. It is easy to seed in legume mixtures and is one of the best grasses for fall planting in favorable years. Timothy is somewhat less aggressive in mixtures than sod-forming grasses due to its non-spreading habit. In legume mixtures, yields for hay are usually somewhat less than brome on good soils but about the same on soils only moderate in fertility. Timothy should not be grown alone except for seed production purposes.

Varieties

Several named varieties of timothy are being produced around the country, but none have shown any superiority to Iowa and Missouri *locally-grown, common* timothy seed in performance trials with red clover or alfalfa.

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Pointers
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Crop
Combinations

GREEN LAWNS

A smooth green lawn with a good dense cover is a joy and comfort to everyone. Establishment and maintenance of beautiful lawns may be made easier by following a few timely suggestions.

First, before planting:

Smooth out the lawn area, provide gentle slopes away from house for drainage, and avoid small dips where water and ice can collect and cause injury. Try to have six inches or more of good fertile topsoil over all the lawn area when establishing final grade. Work in some type of organic matter (well rotted manure, compost, or granulated peat) or grow a green manure crop and plow under if area is large. About a week or so before planting, apply a complete fertilizer high in nitrogen and phosphorus and rake it in. Then smooth down the seedbed as fine as possible just before planting.

Seed in late summer or early fall, as best time, or as early in spring as possible.

Next, plant properly by:

Hand sowing evenly first in one direction, then at right angles, and finally on the diagonal. Don't sow if windy. If a lawn seeder is available a more uniform job can be done. Sow at rate of 1 to 2 pounds per 1,000 square feet. Rake seed in lightly and then firm the soil, if at all possible, with a lawn roller.

After germination and starting growth:

Water moderately and uniformly if necessary to keep soil moist and seedlings alive and growing. Start mowing as soon as grass is high enough to cut—before it is three inches tall. Set mower to cut at *least two inches high*. Cut frequently so cut material need not be removed.

Maintain good lawn by:

Fertilizing with a high nitrogen fertilizer in early spring and complete fertilizer in early fall. Apply when grass is dry and water in. Overseed thin open areas in early fall with pure blue grass seed at one pound per 1,000 square feet. Creeping red fescue at about one and one-half pounds per 1,000 square feet is suggested for shaded areas. Remove excess leaves in fall to prevent smothering of grass. Control broadleaf weeds by spraying with 2,4-D according to recommendations on containers. Avoid spraying on windy days and stay away from shrubs, flowers, and vegetables. Use special sprays recommended for crabgrass control.

For renovating old lawns:

If soil is fairly good but grass is thin, topdress with equal mixture of sand, topsoil and peat or with composted soil. Reseed with one to two pounds of bluegrass per 1,000 square feet.

If soil poor and stand spotty and weedy, work up thoroughly, apply well rotted manure or peat, and reseed as for new lawn planting.

Lawn seed mixtures:

Good seed mixtures can be bought or you can mix your own. Avoid mixtures containing large percentages of non-recommended grasses. A good mixture for open areas should have 50% or more Kentucky bluegrass.

For open areas with plenty of light use following proportions:

5 pounds Kentucky bluegrass

2 pounds domestic ryegrass

2 pounds red top

For shaded areas with limited sunlight use following proportions:

2 pounds Kentucky bluegrass

1 pound domestic ryegrass

1 pound red top

3 pounds of creeping red fescue (or chewings red fescue)

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For playgrounds, athletic areas, and other turf purposes receiving heavy usage, use following proportions:

15 pounds Alta or Kentucky 31 fescue
5 pounds Red Top

Varieties

BLUEGRASS and **TALL FESCUE** varieties are discussed in the section on forage grasses.

DOMESTIC RYEGRASS—No improved varieties available.

RED TOP—No improved varieties available.

CREEPING RED FESCUE—**ILLAHEE** is satisfactory. **RAINIER** and **TRINITY** are new strains about which little is known, should be satisfactory.

ZOYSIA GRASS—Meyer Z-52 Zoysia. This new turf grass generally is not recommended for lawns in Missouri. Growth is mostly in June, July, and August. It kills back at first frost and stays brown until late spring. Slow in growth and establishment. Not shade tolerant and must be planted by sprigs.

KENTUCKY BLUEGRASS (*Poa pratensis*)

A perennial sod-forming grass of major importance in permanent pastures, lawns, and other turf areas in the state. Its primary value for *forage* is as a permanent pasture plant. Greatest growth with bluegrass occurs early in the spring and again in the fall when moisture is sufficient. It is relatively unproductive in midsummer. Does best in mixture with legumes on well drained, productive soils of limestone origin. Usually not recommended for rotation pasture mixtures, because of lower productivity than such grasses as brome grass, timothy or orchardgrass in the warm parts of the growing season. Permanent bluegrass pastures can usually be improved in productivity by proper fertilization, introduction and maintenance of a vigorous legume or legumes, and control of growth and weeds by grazing or mowing or both. Details for renovation are available from your county extension director or the agricultural experiment station. Good bluegrass sod can be stimulated to earlier and more productive growth by an application of 30 to 50 pounds of actual nitrogen per acre in late February or March.

Varieties:

COMMON KENTUCKY BLUEGRASS—No adapted, improved varieties for field use are commercially available to date.

Other Bluegrasses

CANADA, **BIG**, **TEXAS**, **ROUGHSTALK** and other bluegrass species are not recommended in Missouri for forage use or for lawns. Main use is for highway seeding projects.

MERION—A shorter-growing, somewhat disease resistant variety of Kentucky bluegrass that stays greener a little longer than ordinary commercial lots. Was developed mainly for lawn, golf course and other turf purposes. Probably less productive for pasture use than common types. Has been damaged by rust in some areas. It does not have the overall advantages as does common Kentucky Bluegrass.

TALL FESCUE (*Festuca arundinacea*)

A long-lived slow sod forming perennial grass adapted to a wide range of soil types.

Your Advantages—What Tall Fescue Does For You

1. Suitable for controlling erosion on terrace ridges, farm lanes, and other areas liable to be over-grazed.
2. Also of value for protecting waterways and terrace outlets on upland areas where dense sods and ability to grow in wet areas are desired.
3. Would be good in "holding" lots around buildings where a tough sod is needed.
4. Tall fescue is usually less palatable than bluegrass, brome grass, orchardgrass, or timothy, making it less susceptible to over-grazing.
5. This grass is quite drought tolerant but is not suited for light, sandy soils. It has special value for certain turf purposes where a good, tough sod is needed, but repeated close clippings are not necessary. Certain areas on airports, golf course "roughs", and grassed roadways are examples of some possible turf areas.

(Continued on following page)

No Seeding Complete Without NODOGEN Nitrogen Fixing Inoculant

6. Stands are rather easy to establish and maintain as compared to many other forage grasses.
7. Offers more fall and winter pasture than other grasses.
8. Good stands can be obtained with early spring or late summer seeding if planted properly and soil moisture is available.
9. Responds well to increase levels of fertility and is quick to recover.
10. For pasture, use grass/legume mixture to reduce hazard of Fescue foot.

Recommended Varieties

ALTA, an Oregon strain, and *KENTUCKY 31*, a Kentucky strain, are the main varieties in production. Both are satisfactory in this area, since they appear similar in growth, recovery, maturity, disease resistance and productivity.

Other Fescues

MEADOW FESCUE—A different species of fescue with finer leaves. Is less productive than tall fescue and not recommended for forage use.

REEDS CANARY GRASS (*Phalaris arundinacea*)

Tall-growing, leafy, cool-season perennial grass. Rather coarse in forage quality.

Your Advantages—What Reeds Canary Does for You

1. Most important feature is ability to spread rapidly by underground root stalks and establish tough sod on wet, water-logged soil areas.
2. Is most valuable for pasture on poorly drained soils where other palatable grasses won't grow.
3. Excellent as a grass for healing and controlling gullies.
4. Can be used for hay or silage, but is somewhat less palatable than other main grasses.

On upland soils, Reeds canary grass is very drought tolerant, high yielding, and resistant to high temperatures; but seed cost, stand establishment and palatability problems prevent recommendation for such areas. It also becomes sod bound and unproductive after several years.

Tips for Your Successful Management

1. For gully control, planting of small sod pieces or sprigs from "sod bank" or established stand most dependable. Seeding stands may wash away.
2. On flat, wet areas, late summer seedings on a well-prepared seed bed may be best bet. Can be established from early spring seedings, however, if soil conditions favorable.
3. If used for pasture, recognize its high carrying capacity and stock accordingly. Otherwise, becomes more unpalatable as matures.
4. On soils where ladino clover is adapted, Reeds canary grass and ladino offer a good combination. Stand must be kept grazed or clipped down, however, if ladino is not to be crowded out.
5. Cut for hay or silage when first heads appear for best combination of quality and yield.
6. If seeding, be certain to check germination, then plant accordingly.

Varieties

IOREED—Only named variety adapted to north central region. Is vigorous, leafy, and good in stand establishment. Seed supplies are limited.

COMMERCIAL SEED—Seed produced in north central states is satisfactory, but check germination. Seed from west coast or southern regions may produce non-vigorous and non-hardy stands and is not recommended.

Germination, though usually not too high, does a satisfactory job when you plant heavier quantities. (See seed formula under "Good Seed".)

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WHEATGRASSES (*Agropyron species*)

Several different wheatgrasses are important for forage use in the Northern Great Plains and Western states. These are: crested, intermediate, tall, pubescent, stiffhair, slender and western wheatgrass. In the areas where used these various wheatgrasses are noted for their drought tolerance and hardiness. They also have the ability to establish stands under adverse conditions. All of these wheatgrasses have been tested for various periods of time in Missouri, but none has proved to be as good for hay or pasture purposes as the main grasses now grown—bluegrass, timothy or orchardgrass.

RAPE (*Brassica napus*)

A widely adapted biennial grown as an annual for hog and sheep pasture in Missouri.

Your Advantages—What Rape Does for You

1. Is high in protein, a good source of vitamins and the forage is succulent and palatable.
2. Thrives on any fertile soil adapted to corn culture, needs no cultivation, grows rapidly, and seed is relatively low in cost.
3. An early spring seeding may furnish pasture from early summer to late fall freeze-up.
4. Also can be used satisfactorily as a soiling crop.

Tips for Your Successful Management

1. Seed early in spring alone for hog pasture, or with oats for sheep, at a rate of 8 to 10 pounds per acre for longest grazing season.
2. Delay grazing until Rape is 8 to 12 inches tall.
3. Avoid overstocking, give plants chance to maintain growth.

Recommended Variety

Dwarf Essex—considered most satisfactory type for general use.

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SUDAN GRASS (*Sorghum sudanense*)

An outstanding mid-to-late summer temporary pasture crop which can be used for emergency hay or silage purposes.

Your Advantages—What Sudan Grass Does for You

1. Acts as an insurance crop.
2. Its best feature is its ability to grow rapidly after planting in warm weather and to recover rapidly after grazing or cutting.
3. Sudan Grass withstands considerable drought and high temperature, but grows best when soil moisture is plentiful and the weather warm.
4. Plantings made in late May and early June will be ready for grazing in mid-July and remain productive until frost.
5. With rotation grazing, a good stand may carry up to two or three head of mature live-stock per acre.

On medium to low fertility soils, some nitrogen and maybe phosphorous may be needed for maximum production (have soil tested if in doubt). Sudan Grass poisoning generally is not a problem if handled properly. Remember that ruminant animals (cattle, sheep, and goats) are most liable to poisoning than non-ruminants (horses, hogs).

Tips for Your Successful Management

1. Use good seed of varieties low in prussic acid content. Sow 25 to 30 pounds per acre.
2. Do not graze until growth is 18 to 24 inches tall.
3. Do not graze ruminants on young, tender growth or plants partially killed by frost.
4. Rotate grazing, if possible, for maximum production.
5. Do not permit excessively hungry cattle to graze.
6. For hay or silage, cut during heading to soft dough stage.

Recommended Varieties

PIPER—An early strain rapid in growth and recovery developed in Wisconsin. Fairly disease resistant and lowest in prussic acid of any commercial variety. These features combined with good forage production make it one of best strains for this area. Seed of Piper is a mixture of light and dark colors. Production of good, high quality seed, now from a wide area.

GREENLEAF—A late, leafy variety developed in Kansas. Slightly slower in growth and recovery than Piper. Has good disease resistance, juicy stems, and sweet

forage moderately low in prussic acid. Seeds are mahogany colored.

Other Varieties

LAHOMA—A new variety from Oklahoma. Is slightly later than Greenleaf and has good disease resistance, leafiness, and palatability. Moderately low in prussic acid. Only limited information is available, but probably somewhat lower than Piper in forage yield due to lateness. Seeds sienna or orange-red in color.

TIFT—Moderately late, leafy disease resistant variety from Georgia. Only average

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in yield and slower in growth than Piper. Seeds are mixture of chocolate and tan colors.

SWEET and SWEET 372—Medium in maturity with juicy stems and sweet forage. Generally slow growing. Disease susceptible under wet conditions. Rather low

yielding in pasture clipping tests. Seeds are sienna or orange-red in color.

WHEELER—An old variety from Kansas which is early, dry stemmed and disease susceptible. Yields well and grows rapidly but forage usually of low quality.

FORAGE SORGHUM (*Sorghum vulgare*)

An annual tall-growing, coarse grass noted for its good drought and high temperature tolerance. The sweet sorghums (or sorgos) are grown mainly for silage or fodder, but also may be used for stover, hay, pasture, and soiling. The most efficient way to use forage is for silage, since the forage preserved this way is very palatable and nutritious. Under favorable conditions some sorgos may yield up to 20 tons or more per acre for silage. Generally, the green plants are not desirable for pasturing this far north because of danger from prussic acid poisoning. Several factors are important in growing sorghums to best advantage for forage. Some management tips follow:

Management Tips

1. Seed recommended varieties in late May or early June for maximum production, though planting up to about July 15 is possible.
2. Treat seed with such compounds as Ceresan M, Panogen, Sperguson, Arasan, etc., to insure good stands. Use high germinating, high purity seed.
3. Plant 10 to 12 pounds per acre in wide cultivated rows or about 60 pounds per acre or so in solid drill seeding.
4. Control weeds the same as for corn or beans.
5. Harvest for silage when seed approaching hard dough stage to get maximum sugar content.
6. For fodder or bundle feed, grind, shred, or chop dry forage to promote feeding efficiency.
7. **Don't** graze plants partly killed by drought or frost. **Don't** graze young plants or new regrowth after cutting.

8. Fields killed by frost with no green regrowth can be pastured satisfactorily.

Acceptable Varieties

ATLAS—A full season, high yielding, lodging resistant variety for late May and early June planting.

AXTELL, NORKAN, ELLIS, ROX ORANGE — All sweet types somewhat earlier than Atlas, but good in yield.

SMALL GRAINS FOR FORAGE

Use of small grain crops for hay, pasture or silage purposes in the case of feed shortages or stand failures is a good step. Grazing of oats used as a companion crop for birdsfoot trefoil and rape seedings is discussed elsewhere. It also is possible to graze oats seeded as a companion crop for other forage seedings rather than harvesting for seed. This may give good pasture for several weeks in May and early

(Continued on following page)

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June. Grazing should start just before the plants head and should be heavy enough to remove the entire oat crop quickly and evenly. Avoid grazing when fields are wet and soft. Other suggestions for using small grains for emergency forage use follow:

1. **Oats seeded alone** in early spring at 3 to 4 bushels per acre will provide grazing for a period of 4 to 5 weeks, or from about mid-May to mid-June. Grazing may start when the oats are 8 to 10 inches tall. From 30 to 60 pounds of actual nitrogen applied per acre will increase growth and needs to be considered for a high yield of oat forage. Also can be used for hay or silage, if needed.

2. **Winter wheat or winter rye** seeded in early spring at 1½ to 2 bushels per acre will usually be ready to graze by mid-May and continue through late June. Spring

seeded winter cereal grains usually will not head and will continue to make forage growth longer than oats. From 30 to 60 pounds of actual nitrogen per acre should be applied to these crops for a high yield of pasture.

3. **Fall seeded winter rye** may provide a limited amount of fall and early winter grazing if weather and soil conditions are favorable for establishment. Seeding 1½ to 2 bushels per acre in mid-September is recommended. Fall established winter rye provides some of the earliest spring grazing. The Balbo variety is about as winter hardy as winter wheat in Missouri and is recommended for dairy animals. Other varieties of rye are more winter hardy and are satisfactory for general use. Rye pasture should be plowed by about May 15, and seeded to some other crop.

Maturity and Height Table

GRAIN SORGHUMS	Maturity	Height
Redbine 60	110-115 days	30 to 40 inches
Martin	110-115 days	30 to 40 inches
Midland	110-115 days	30 to 40 inches
Combine Kafir 60	112-117 days	30 to 40 inches
Westland	112-117 days	30 to 40 inches
Plainsman	112-117 days	30 to 40 inches
FORAGE SORGHUMS		
Atlas	120 days or more	7-8 feet
Axtell	110-115 days	6-7 feet
Norkan	107-112 days	6-7 feet
Rox Orange	105-110 days	6-7 feet
Ellis	105-112 days	

These values are approximate as the college does not have exact data for Missouri conditions.

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COMBINE GRAIN SORGHUM (*Sorghum vulgare*)

Interest in grain sorghum production has increased greatly in Missouri the last few years. From limited research and farm experiences to date, it appears that the crop will grow and produce satisfactorily in any part of the state. Since it is a warm weather crop and tolerant to drought and high temperatures, sorghum appears more promising for the drier and warmer areas of southern and western Missouri.

In comparison with corn, sorghum appears to do best where corn is hurt by drought and high temperatures. When good corn growing conditions occur, corn usually does as good or better than sorghum.

Sorghum grain is used mostly for livestock or poultry feed. Feeding value is similar to or slightly below that of corn. Feeding efficiency for cattle and hogs is best where the grain is ground or cracked first to prevent passing through the animals without being digested. Sheep and poultry apparently do well on whole grain.

Management Tips

1. Use high germinating, high purity seed of recommended varieties. Seed treatment is very important; use Ceresan M, Panogen, Spergon, Arasan, or similar compounds.
2. Sow in corn-width rows, one to one and one-half inches deep, at rate of *three to five pounds* of seed per acre.
3. Delay planting until soil warmed to 70 degrees F. or better. Best planting time two weeks after normal time for planting corn.
4. Control weeds same as with corn.
5. Fertilize as for corn but avoid heavy amounts of nitrogen which may cause lodging.
6. Wait until heads and upper stems are dry before combining; adjust combine carefully to do a good job.
7. Seed should be clean and down to 12% or 13% moisture for safe storage. Use artificial drying, if necessary, to prevent spoilage.
8. Don't permit livestock to graze young, tender plants, plants wilted by drought, or plants partly killed by frost.

Recommended Varieties

(on basis of limited results)

MARTIN, MIDLAND, WESTLAND, PLAINSMAN and *REDBINE 60*—All reddish colored seed, satisfactory in height, good in standability and yield, and similar in maturity.

COLBY—An early maturing variety with high yield potential. Very desirable plant characteristics until maturity. If harvesting is delayed it lodges badly.

COMBINE KAFIR 60—White seeded kafir type of suitable height. Somewhat variable in performance. Very productive under favorable conditions. Seed more liable to weather than red seeded types. Slightly later than Midland.

Other Varieties

A number of other varieties are grown in the central and southwest great plains. Many of these probably would be too late to mature properly in most years in Missouri.

HYBRID SORGHUM—Development and testing of experimental hybrids is under way in the main sorghum areas. Several have been tested in Missouri. Results indicate that not all hybrids are superior, but some yield well above the best varieties. Further testing is needed to determine which hybrids are best in performance and adaptation to different areas. Seed stocks also must be increased before seed for commercial plantings will be available to any extent.

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SOYBEANS (*Glycine max*)

Besides their main use as a cash seed crop, soybeans also may be valuable for forage purposes alone or in mixtures with other crops. As an emergency crop for late planting, soybeans are a good possibility because of high feed value and their good drought resistance during the green growing stages. May be used for hay, silage, soiling, or green manure. If used for forage, planting rates should be stepped up about 25 per cent or more compared to rates for seed production. This practice gives thinner stems which in turn will be easier to cure and more palatable. Drilling would be preferred to wide-row seeding in most instances. Harvesting for hay is best done when pods are about one-half filled. Use same varieties as recommended for seed production.

Some Suggested Combinations Using Soybeans Are as Follows:

SOYBEANS ALONE—Plant any time up to July 15, though should use somewhat earlier varieties for latest planting. Rate of planting about 35 to 45 pounds per acre in rows and about 60-90 pounds per acre drilled solid.

SOYBEANS—SUDANGRASS COMBINATION—An excellent forage crop. For late May or June planting about 45 pounds of soybeans and 10 pounds of sudangrass can be drilled together per acre. For June or early July planting can seed soybeans first at 60 to 90 pounds per acre. Then 10 days or so later broadcast sudangrass at about 5 pounds per acre and cover with weeder, rotary hoe or harrow.

SOYBEANS—FORAGE SORGHUM COMBINATION—For hay, soiling, or silage. Probably best to seed in rows. Planting can be done anytime from late May to mid-July. Use about 10-15 pounds of sorghum and 40-45 pounds of soybeans per acre.

SOYBEANS-MILLET COMBINATION—Possibly for hay and other uses. Drill in about 60 pounds of soybeans and 20 pounds of millet per acre up to mid-July or so.

SOYBEANS FOR HAY—Virginia and Wilson throughout the state, Laredo in southern one-fourth. All grain varieties will make good hay when planted thick—1 to 1½ bushels per acre.

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FOXTAIL MILLET (*Setaria italica*)

Millets are grown on a limited scale in Missouri and then only when a late planted emergency crop for hay or green manure is desired. They make satisfactory yields on thin or dry land. They are annuals that can be planted late and still produce a hay crop in 40 to 50 days or will mature a seed crop in 60 to 70 days.

Foxtail millets have dense heads like weedy foxtail grasses. Grain from foxtail millets is less palatable, about 83 per cent the feeding value of corn. The grain is used mostly in chicken and birdseed feed mixtures.

Among the several standard varieties German (Golden), Dakota Kursk, White Wonder and Siberian appear to be the best under the conditions of Missouri. Seeding 20 to 30 pounds per acre with a grain drill in late June, July, or early August will usually provide a good hay crop before frost. For best quality hay cut when in full bloom and handle the crop like timothy hay.

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GOOD QUALITY SEED

Nothing is more basic in the needs of the farmer than Quality Seed. Seed is the unknown life that produces all our crops. **To You, the Farmer,** wanting to plant a crop that will provide a profitable stand, you must have good seed, which consists of these three things:

1. Seed with a Good Germination.
2. Seed that is free of impurities, such as other crop and weed seed.
3. Seed of a variety that is recommended for your area.

Use of good quality seed, rather than unknown seed at bargain prices or of untested quality, may well determine the amount of success with any seeding.

High Quality Seed Will Meet These Requirements:

1. Bear a tag showing a complete test by a competent company or certifying agency.
2. Will be free of Noxious Weeds according to the State Law.
3. Have a High Purity, Germination. (Note minimum standards for certification on page 27. Royal Quality Seed will at all times be of a higher standard.)
4. Comply to all the provisions in the Missouri law.

Low Quality Seed Too Costly at Any Price

Everyone knows the biblical warning against building a house on sand, also the folly of spending money on the materials that go into a house and trying to save on a cheap foundation.

But do farmers realize that the same principle applies to the purchase of seed for planting? Good stands of grasses, clovers and other crops come only from good seed.

Fertilizer, labor and machinery are also necessary, but they are often wasted when spent on poor seed which is the foundation of a good stand and in the end, a good crop. And the cost of good seed is often little compared to other costs. Especially is the difference in price between high and low quality seed relatively low.

When sown at the rate of 8 or 10, even 15 or 20 pounds to the acre, a possible difference in cost might be \$1.00 to \$1.50 or at most \$2.00 per acre. Is it worth taking a chance on your crop for as little as that? And with perennial grasses and legumes, this increased cost is only for one year, while the better crop resulting from it is likely to be repeated for a number of years.

Since most hay and pasture seeds are purchased from a seed dealer and not grown on the farm where used, it behooves the farmer-buyer to know how to buy his seed intelligently.

Seed of uncertain quality bought from a neighbor, either directly from the combine or as "fanned" by a farm fanning mill, may look good. Or the truck peddler may have rather good looking seed to offer at a "bargain" price that is tempting. But, what do you really know about these seeds? Do you know the germination? Or purity? Their freedom from noxious weed seeds? Their trueness to variety? Can you depend on verbal or unreliable statements as to these? Certainly not—see that the seed you buy bears the analysis tag of a reliable dealer who will stand back of the statements made. And remember, too, that price shouldn't be the deciding factor.

It costs money to produce high quality seed. Seedsmen have a heavy investment in costly cleaning and refining machinery of many kinds and employ skilled operators and technical staff for their seed test-

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ing laboratories for a good reason. But the cost of the seed from a reliable seedsman is more than justified by the high quality obtained.

The seed-analysis-tag required by law on every bag is for the farmer's protection. It tells him the quality—how free of weeds

it is, the purity, the germination, and date of test. If the seed is of an improved variety, it should also bear the certified tag of any official State certification agency. High quality seed is the foundation to build on. High quality seed of known origin and known quality, is the least cost in making a good crop.

Certified Seed in Missouri

Certified seed is seed produced under rigid field inspection conditions and meeting specified standards of quality and insures you trueness of variety. Only varieties showing superior yield, disease resistance, and adaptation are certified in Missouri. The requirements and rules for certification of different crops are determined by the Missouri Seed Improvement Association, a group of seed producers cooperating with each other and Missouri College of Agriculture, at Columbia, Mo. Seed sold as certified must be labeled with a blue tag containing the word "certified" and other information prescribed by the Missouri Seed Improvement Association. This story of certification is true for most all states.

State Seed Laws

Agricultural seeds to be sold for planting purposes in Missouri must meet certain requirements under the Missouri State Seed Law. Some of the more important points in this law are:

1. Crop seed must not contain any primary noxious weed seed. Primary noxious weeds in Missouri are:

Field Bindweed
Johnson Grass
Canada Thistle

2. Crop seed should not contain more than one and one-half per cent of weed seeds by weight subject to prescribed tolerance limits.

3. Crop seed must have been tested for germination within a nine-month period prior to the time it is sold or offered for sale.

4. Each crop seed container must bear a visible label or tag giving the following information:

- The kind, or kind and variety, of crop seed together with percentage of each kind of crop seed in excess of five per cent by weight.
- Lot number or other lot identification.
- Origin, if known. If origin unknown the fact should be stated.
- Percentage by weight of all weed seeds.
- The name and approximate number of each kind of secondary noxious weed seed in excess of certain minimum numbers per ounce or pound as specified.

f. Percentage by weight of agricultural seeds other than those required to be named on the label.

g. Percentage by weight of inert matter.

h. Percentages of germination for each named crop seed, percentage of hard seed if present and date germination test was completed.

i. Warning if poisonous seed treatment used on the seed.

5. Secondary noxious weeds in Missouri are:

<i>Buckhorn</i>	<i>Quackgrass</i>	<i>Rumex Spp.</i>
<i>Wild Carrot</i>	<i>Russian Thistle</i>	<i>Yellow Star Thistle</i>
<i>Oxeye Daisy</i>	<i>Red Sorrel</i>	<i>Leafy Spurge</i>
<i>Dodders</i>	<i>Hedge Bindweed</i>	<i>Perr. Pepper Grass</i>
<i>Wild Onion</i>	<i>Garlic</i>	

For more detailed specifications of the Missouri State Seed Law write to the Missouri Secretary of Agriculture, State Office Building, Jefferson City, Mo.

Remember that good seed should meet all requirements of the Missouri State Seed Law.

Seed Testing

Testing facilities for determining purity and germination of crop seed are maintained by the State Seed Laboratory, Jefferson City, Mo. Any resident of the state can submit samples of seed for testing to this laboratory.

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PLANTING POINTERS (for Grasses and Legumes)

Seeding procedures can play a vital part in successful production of any crop. Even the best crop, the best variety, and the best seed can fail to give a good stand if a poor job of planting is done. It's the good stand of healthy seedlings in the field that really counts.

In getting ready to plant, remember the following points:

1. Use good seed of a recommended variety.
2. Treat the seed, if needed.
3. Inoculate legume seed with proper strain of bacteria.
4. If seeding a mixture all at one time, mix seed accurately and completely first.
5. Be certain that lime and fertilizer requirements of the soil are met—use soil tests for a guide.
6. Clean up seeders and check their calibrations—overplanting can be costly, too.
7. Be ready to plant at the best seeding time.

Seeding rates for various crops and mixtures were suggested earlier. These rates are for high quality seed and should give good stands if planting is done well. If you have seed of a recommended variety, but germination and purity are below the per cent desired for good seed (see pages 2 and 3) adjust your rate of seeding upward with this formula:

$$\text{Adjusted seed-} \frac{\text{Recommended seeding rate} \times 8,000}{\text{ing rate} \quad \text{Per cent purity} \times \text{per cent germination}}$$

This adjustment compensates quite well for reduced germination and purity in most crops. If the seed is really poor in these features, don't use it—chances are too great for weak, non-healthy seedlings.

In sowing the forage crop or mixture:

Prepare a good, firm seedbed.

Use the best planting equipment available. (Using well calibrated grain drills, with grass seed attachment and special seeders are helpful in obtaining a uniform stand.)

Sow shallow, $\frac{1}{4}$ to $\frac{1}{2}$ inch deep is about right for most forage crops. Deeper planting is especially bad for crops like trefoil, ladino, or timothy; but alfalfa, red clover, tall fescue, and brome grass can come up from somewhat greater depths. Seed at the right time.

Firm soil around seed by packing or rolling to promote quick germination, if not done during planting operation.

Use of *companion crops* for forage seeding is the common practice in Missouri. When possible, cut down the seeding rate of the small grain crop and use an early variety to help in getting a stand. Often, with a semi-permanent or permanent pasture seeding, the companion crop is grazed off if there is danger of a stand failure.

When seeding in winter wheat or winter barley, some crops, like timothy, can be fall seeded at the same time. Most forages seeded in winter grain crops should be broadcast on frozen ground or drilled in the wheat as early in spring as possible. Otherwise, the seedlings will be crowded out by the fast-growing small grain crops.

In managing the stand during the seeding year:

Check for insect damage—like sweet clover weevils—and spray or dust for control.

Remove straw after grain harvest if too heavy a cover.

Clip the stubble a month or so before frost to prevent weed crop from going to seed.

Pasture seeding only lightly after grain harvest, if at all. Don't pasture the last month before frost, as a rule.

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SEED FACTS

C R O P	Standard Weight Per Bushel (Pounds)	Seeds Per Pound	Minimum Seed Standards for Certification†	
			Germination (%)	Pure Seed (%)
Alfalfa	60	225,000	80*	98
Red Clover.....	60	295,000	80	98
Ladino (White Clover).....	60	880,000	85*	98
Alsike Clover.....	60	680,000	No standards available	
Birdsfoot Trefoil.....	60	370,000	80*	98
Sweet Clover.....	60	260,000	80*	98
Korean Lespedeza.....	40	(Unhulled) 238,000	80*	98
Soybeans	60	2,000-4,000	80	97
Bromegrass	14	136,000	80	85
Orchardgrass	14	550,000-650,000	80	85
Timothy	45	1,130,000	80	97
Kentucky Bluegrass.....	14	2,200,000	70	90
Tall Fescue.....	22-27	227,000	80	95
Reeds Canarygrass.....	44-48	533,000-680,000	65	96
Sudangrass	40	40,000-60,000	80	97
Forage Sorghum.....	50	20,000-30,000	80	97
Wheat	60	12,000	80	97
Oats	32	13,000	80	97
Rye	56	18,000	70	97
Barley	48	13,500	80	97
Grain Sorghum.....	56	23,000	80	97
Foxtail Millet.....	50	214,000	70	97
Rape	50	160,000	No standards available	

* Total germination plus per cent hard seed.

† Standards for wheat, oats, barley, rye, soybeans, bromegrass, tall fescue, red clover, and lespedeza are for Missouri. All others are International Crop Improvement Association Standards.

Royal Quality Seed will at all times be of higher standards than those listed above.

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LEGUME INOCULATION

Reasons for Inoculation:

- Insure presence of fresh nitrogen-fixing bacteria.
- Promote nitrogen fixation—more nitrogen from air and less from soil used in producing legume crops.
- Increase chances for good establishment and vigorous growth due to better nitrogen availability.
- Increase yield of the legume crop—especially on soils low in available nitrogen.
- Improve quality (protein content) of legume crop.
- Improve green manure value and soil fertility.

When and How to Inoculate:

- Always inoculate as an insurance measure to provide proper nodulation in the plant's root system.
- Use right inoculant for the legume to be planted.
- Use fresh commercial culture, which should be kept in cool, dark place until used.
- Follow directions on container—mix seed well with culture.
- Plant within 48 hours after inoculation.

Legume Cross-Inoculation Groups:

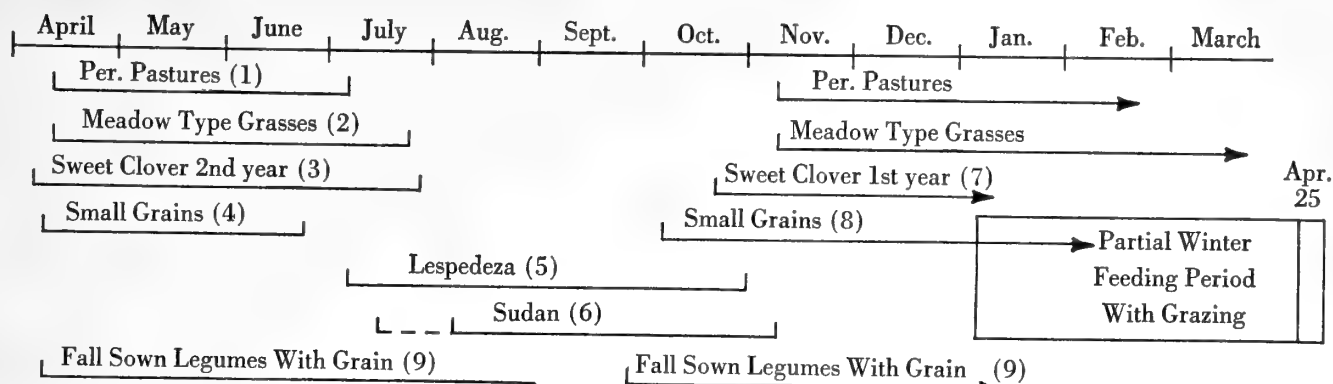
(Bacteria effective for one group generally will not inoculate crops in any other group.)

1. *Alfalfa Group*—Alfalfas, sweet clovers, bur clovers, sour clover, black medic.
2. *Clover Group*—Red, alsike, white, ladino, crimson, hop, strawberry, Persian, etc.
3. *Peas and Vetch Group*—Field, garden, sweet, rough, flat and Austrian winter peas, vetches, lentils.
4. *Bean Group*—Garden, kidney, navy, pinto and scarlet runner beans.
5. *Soybean Group*—All soybeans.
6. *Cowpea Group*—Cowpeas, lespedezas, crotalarías, kudzu, guar, peanuts, lima beans, ming bean, velvet bean and others.
7. *Lupine Group*—All lupines.
8. *Specific Plant Groups* (each is different).
 - a. Birdsfoot trefoil
 - b. Big trefoil
 - c. Sanfoin
 - d. Crown vetch
 - e. Astragalus

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Crop Combinations and Management to Produce Seasonal Pasture

MISSOURI



- (1) Rate of grazing and exact termination depending on season and available other pastures.
- (2) Optional spring, early summer pasture, hay or seed followed by fall, winter pasture.
- (3) Grazed for short period—then turned under (or cut for seed) or grazed full period.
- (4) Grazed for short spring period and harvested for grain or grazed out entirely.
- (5) Grazed to frost date or completely by September 1 for early fall seeding of grain.
- (6) Sown early June or late July depending on preceeding crop and period of need.
- (7) Protected from grazing during summer. Fall use for pasture or hay.
- (8) Rye or barley (winter oats) for early fall and winter along with wheat for mid-winter use.
- (9) Sweet clover, winter vetch or crimson clover sown in late summer along with winter rye, barley or oats.

(Space for new developments or recommendations)

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(Space for new developments or recommendations)

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